PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Examiner:	Unknown	Docket: WWS 96-011 DIV
Applicant:	Brian W. Kroeger et al.	
Serial No.	Not Yet Assigned	Group Art Unit
Filed:	Herewith	In response to Paper No:

Title: A SYSTEM AND METHOD FOR MITIGATING INTERMITTENT INTERRUPTIONS IN AN AUDIO RADIO BROADCAST SYSTEM

PRELIMINARY AMENDMENT

December 22, 2000

Assistant Commissioner for Patents
Washington, DC 20231

Sir:

Please amend the above-identified application as follows:

In the Specification:

Page 1, after the title insert

-- CROSS REFERENCE TO RELATED APPLICATION

This application is a divisional application of United States Patent Application Serial No. 08/947,902, filed October 9, 1997. --

Page 12, line 16, delete "a" and substitute -- an --.

Page 21, line 19, delete "multiplex subcarriers" and substitute -- modulated carrier --.

Page 22, line 1, delete "multiplex" and substitute -- modulated --.

Page 22, line 12, delete "multiplex" and substitute -- modulated --.

In the Claims:

Please cancel claims 1-20.

Please add the following new claims:

-- 21. A method of in-band on-channel broadcasting comprising the steps of:

providing an analog signal to be broadcast;

providing a digital signal to be broadcast;

delaying said digital signal with respect to said analog signal;

modulating a first carrier with said analog signal;

orthogonal frequency division modulating a plurality of subcarriers with said digital signal, said plurality of subcarriers being positioned in upper and lower sidebands with respect to said first carrier;

combining said first carrier and said plurality of subcarriers to produce a composite signal; and

transmitting said composite signal.

22. A method of in-band on-channel broadcasting as recited in claim 21, wherein said analog signal and said digital signal represent the same audio information.

23. A method of in-band on-channel broadcasting as recited in claim 21, wherein:

said first carrier is frequency modulated;

said upper sideband ranges from about 130 kHz to about 199 kHz from said first carrier; and

said lower sideband ranges from about -130 kHz to about -199kHz from said first carrier.

24. An in-band on-channel broadcasting transmitter comprising:

means for providing an analog signal to be broadcast;

means for providing a digital signal to be broadcast;

means for delaying said digital signal with respect to said analog signal;

means for modulating a first carrier with said analog signal;

means for orthogonal frequency division modulating a plurality of subcarriers with said digital signal, said plurality of subcarriers being positioned in upper and lower sidebands with respect to said first carrier;

means for combining said first carrier and said plurality of subcarriers to produce a composite signal; and

means for transmitting said composite signal.

25. An in-band on-channel broadcasting transmitter as recited in claim 24, wherein said analog signal and said digital signal represent the same audio information.

26. An in-band on-channel broadcasting transmitter as recited in claim 24, wherein:

said first carrier is frequency modulated;

said upper sideband ranges from about 130 kHz to about 199 kHz from said first carrier; and

said lower sideband ranges from about -130 kHz to about -199kHz from said first carrier.

27. A method of receiving an in-band on-channel composite broadcast signal including a first carrier modulated by an analog signal, a plurality of subcarriers positioned in upper and lower sidebands with respect to said first carrier and orthogonal frequency division modulated by a digital signal, wherein said analog signal is delayed with respect to said digital, said method comprising the steps of:

demodulating said first carrier to produce a first demodulated signal;

demodulating said plurality of subcarriers to produce a second demodulated signal;

delaying said second demodulated signal with respect to said first demodulated signal;

selecting one said first and second demodulated signals to be used to produce an output signal; and

producing an output signal in response to the selected one of said first and second demodulated signals.

28. A method of receiving an in-band on-channel broadcast signal as recited in claim 27, wherein said analog signal and said digital signal represent the same audio information.

29. A method of receiving an in-band on-channel broadcast signal as recited in claim 27, wherein:

said first carrier is frequency modulated;

said upper sideband ranges from about 130 kHz to about 199 kHz from said first carrier; and

said lower sideband ranges from about -130 kHz to about -199kHz from said first carrier.

30. A method of receiving an in-band on-channel broadcast signal as recited in claim 27, wherein said step of selecting one said first and second demodulated signals to be used to produce an output signal comprises the step of:

detecting degradation of one said first and second demodulated signals by determining one or more parameters selected from the group consisting of signal-to-noise ratio, bit error rate, signal power level and cyclic redundancy check.

31. A receiver for an in-band on-channel broadcast signal including a first carrier modulated by an analog signal, a plurality of subcarriers positioned in upper and lower sidebands with respect to said first carrier and orthogonal frequency division modulated by a digital signal, wherein said analog signal is delayed with respect to said digital signal, said receiver comprising:

means for demodulating said first carrier to produce a first demodulated signal;

means for demodulating said plurality of subcarriers to produce a second demodulated signal;

means for delaying said first demodulated signal with respect to said second demodulated signals;

means for selecting one said first and second demodulated signals to be used to produce an output signal; and

means for producing an output signal in response to the selected one of said first and second demodulated signals.

32. A receiver for an in-band on-channel broadcast signal as recited in claim 31, wherein said analog signal and said digital signal represent the same audio information.

33. A receiver for an in-band on-channel broadcast signal as recited in claim 31, wherein:

said first carrier is frequency modulated;

said upper sideband ranges from about 130 kHz to about 199 kHz from said first carrier; and

said lower sideband ranges from about -130 kHz to about -199kHz from said first carrier.

34. A receiver for an in-band on-channel broadcast signal as recited in claim 31, wherein said means for selecting one said first and second demodulated signals to be used to produce an output signal comprises:

means for detecting degradation of one said first and second demodulated signals by determining one or more parameters selected from the group consisting of signal-to-noise ratio, bit error rate, signal power level and cyclic redundancy check.

35. A method of transmitting a broadcast signal, comprising the steps of:

providing a first digital broadcast signal;

generating a second digital broadcast signal that is delayed in time with respect to the primary broadcast signal, the second digital broadcast signal having a lower data rate that the first digital broadcast signal;

combining the first digital broadcast signal and the second digital broadcast signal to form a composite signal; and

transmitting the composite signal.

36. A method of transmitting a broadcast signal as recited in claim 35, wherein:

said first digital broadcast signal is used to modulate a first plurality of sub-carriers within a broadcast channel; and

said second digital broadcast signal is used to modulate a second plurality of sub-carriers within the broadcast channel.

37. A method of transmitting and receiving a broadcast signal, comprising the steps of:

providing a primary broadcast signal;

generating a redundant broadcast signal that is delayed in time with respect to the primary broadcast signal, and combining the primary broadcast signal and the redundant broadcast signal to form a composite signal;

transmitting the composite signal;

receiving the composite signal and separating the composite signal into the primary broadcast signal and the redundant broadcast signal; and

blending an output of a receiver from the primary broadcast signal to the redundant broadcast signal when the primary broadcast signal is degraded.

38. A method of receiving a composite signal including a primary broadcast signal and a redundant broadcast signal that is delayed in time with respect to the primary broadcast signal, the method comprising the steps of:

receiving the composite signal and separating the composite signal into the primary broadcast signal and the redundant broadcast signal; and

blending an output of a receiver from the primary broadcast signal to the redundant broadcast signal when the primary broadcast signal is degraded.

39. The method of claim 38, wherein:

the primary broadcast signal comprises a digital signal; and

the redundant broadcast signal comprises an analog signal.

40. The method of claim 38, wherein:

the primary broadcast signal comprises a first digital signal; and

the redundant broadcast signal comprises a second digital signal having a lower data rate than said first digital signal.

41. The method of claim 38, further comprising the step of:

using the redundant broadcast signal to tune the receiver to a channel of interest.

42. An in-band on-channel broadcasting transmitter comprising:

an input for receiving an analog signal to be broadcast;

an encoder for providing a digital signal to be broadcast;

a time delay for delaying said digital signal with respect to said analog signal;

a first modulator for modulating a first carrier with said analog signal;

a second modulator for orthogonal frequency division modulating a plurality of subcarriers with said digital signal, said plurality of subcarriers being positioned in upper and lower sidebands with respect to said first carrier;

a combiner for combining said first carrier and said plurality of subcarriers to produce a composite signal; and

an antenna for transmitting said composite signal.

43. An in-band on-channel broadcasting transmitter as recited in claim 42, wherein said analog signal and said digital signal represent the same audio information.

44. An in-band on-channel broadcasting transmitter as recited in claim 42, wherein:

said first carrier is frequency modulated;

said upper sideband ranges from about 130 kHz to about 199 kHz from said first carrier; and

said lower sideband ranges from about -130 kHz to about -199kHz from said first carrier.

45. A receiver for an in-band on-channel broadcast signal including a first carrier modulated by an analog signal, a plurality of subcarriers positioned in upper and lower sidebands with respect to said first carrier to be broadcast and orthogonal frequency division modulated by a digital signal, wherein one of said analog signal is delayed with respect to said digital signal, said receiver comprising:

a demodulator for demodulating said first carrier to produce a first demodulated signal and for demodulating said plurality of subcarriers to produce a second demodulated signal;

a time delay for delaying one of said first and second demodulated signals with respect to the other of said first and second demodulated signals;

a blend control for selecting one said first and second demodulated signals to be used to produce an output signal; and

an output for producing an output signal in response to the selected one of said first and second demodulated signals.

46. A receiver for an in-band on-channel broadcast signal as recited in claim 45, wherein said analog signal and said digital signal represent the same audio information.

47. A receiver for an in-band on-channel broadcast signal as recited in claim 45, wherein:

said first carrier is frequency modulated;

said upper sideband ranges from about 130 kHz to about 199 kHz from said first carrier; and

said lower sideband ranges from about -130 kHz to about -199kHz from said first carrier.

48. A receiver for an in-band on-channel broadcast signal as recited in claim 45, wherein said blend control for selecting one said first and second demodulated signals to be used to produce an output signal comprises:

a signal detector for detecting degradation of one said first and second demodulated signals by determining one or more parameters selected from the group consisting of signal-to-noise ratio, bit error rate, signal power level and cyclic redundancy check.

49. A method of in-band on-channel broadcasting comprising the steps of:

providing a first digital signal to be broadcast;

providing a second digital signal to be broadcast, said second digital signal having a lower data rate than said first digital signal;

delaying said second digital signal with respect to said first digital signal;

orthogonal frequency division modulating a first plurality of subcarriers with said first digital signal, said first plurality of subcarriers being positioned in upper and lower sidebands with respect to said first carrier;

orthogonal frequency division modulating a second plurality of subcarriers with said second digital signal;

combining said first and second plurality of subcarriers to produce a composite signal; and

transmitting said composite signal.

50. A method of in-band on-channel broadcasting as recited in claim 49, wherein said first digital signal and said second digital signal represent the same audio information.

51. A method of in-band on-channel broadcasting as recited in claim 49, wherein:

said upper sideband ranges from about 130 kHz to about 199 kHz from said first carrier; and

said lower sideband ranges from about -130 kHz to about -199kHz from said first carrier.

52. An in-band on-channel broadcasting transmitter comprising:

means for providing a first digital signal to be broadcast;

means for providing a second digital signal to be broadcast;

means for delaying said second digital signal with respect to said first digital signal;

means for orthogonal frequency division modulating a first plurality of subcarriers with said first digital signal, said first plurality of subcarriers being positioned in upper and lower sidebands with respect to said first carrier;

means for orthogonal frequency division modulating a second plurality of subcarriers with said second digital signal;

means for combining said and second plurality of subcarriers to produce a composite signal; and

means for transmitting said composite signal.

53. An in-band on-channel broadcasting transmitter as recited in claim 52, wherein said first digital signal and said second digital signal represent the same audio information.

54. An in-band on-channel broadcasting transmitter as recited in claim 52, wherein:

said upper sideband ranges from about 130 kHz to about 199 kHz from said first carrier; and

said lower sideband ranges from about -130 kHz to about -199kHz from said first carrier.

55. A method of receiving an in-band on-channel composite broadcast signal including a first plurality of subcarriers positioned in upper and lower sidebands of a broadcast channel and orthogonal frequency division modulated by a first digital signal, and a second plurality of subcarriers orthogonal frequency division modulated by a second digital signal wherein said second signal is delayed with respect to said first digital signal, and said second digital signal has a lower data rate than said first digital signal, said method comprising the steps of:

demodulating said first plurality of subcarriers to produce a first demodulated signal;

demodulating said second plurality of subcarriers to produce a second demodulated signal;

delaying said second demodulated signal with respect to said first demodulated signal;

selecting one said first and second demodulated signals to be used to produce an output signal; and

producing an output signal in response to the selected one of said first and second demodulated signals.

56. A method of receiving an in-band on-channel broadcast signal as recited in claim 55, wherein said first digital signal and said second digital signal represent the same audio information.

57. A method of receiving an in-band on-channel broadcast signal as recited in claim 55, wherein:

said upper sideband ranges from about 130 kHz to about 199 kHz from said first carrier; and

said lower sideband ranges from about -130 kHz to about -199kHz from said first carrier.

58. A method of receiving an in-band on-channel broadcast signal as recited in claim 55, wherein said step of selecting one said first and second demodulated signals to be used to produce an output signal comprises the step of:

detecting degradation of one said first and second demodulated signals by determining one or more parameters selected from the group consisting of signal-to-noise ratio, bit error rate, signal power level and cyclic redundancy check.

59. A receiver for an in-band on-channel broadcast signal including a first plurality of subcarriers positioned in upper and lower sidebands of a broadcast channel and orthogonal frequency division modulated by a first digital signal, and a second plurality of subcarriers orthogonal frequency division modulated by a second digital signal, wherein said second digital signal is delayed with respect to said first digital signal, said receiver comprising:

means for demodulating said first plurality of subcarrier to produce a first demodulated signal;

means for demodulating said second plurality of subcarriers to produce a second demodulated signal;

means for delaying said first demodulated signal with respect to said second demodulated signal;

means for selecting one said first and second demodulated signals to be used to produce an output signal; and

means for producing an output signal in response to the selected one of said first and second demodulated signals.

60. A receiver for an in-band on-channel broadcast signal as recited in claim 59, wherein said first digital signal and said second digital signal represent the same audio information.

61. A receiver for an in-band on-channel broadcast signal as recited in claim 59, wherein:

said upper sideband ranges from about 130 kHz to about 199 kHz from said first carrier; and

said lower sideband ranges from about -130 kHz to about -199kHz from said first carrier.

62. A receiver for an in-band on-channel broadcast signal as recited in claim 59, wherein said means for selecting one said first and second demodulated signals to be used to produce an output signal comprises:

means for detecting degradation of one said first and second demodulated signals by determining one or more parameters selected from the group consisting of signal-to-noise ratio, bit error rate, signal power level and cyclic redundancy check.

63. An in-band on-channel broadcasting transmitter comprising:

an encoder for providing a first digital signal to be broadcast and a second digital signal to be broadcast;

a time delay for delaying said second digital signal with respect to said first digital signal;

a modulator for orthogonal frequency division modulating a first plurality of subcarriers with said first digital signal, said first plurality of subcarriers being positioned in upper and lower sidebands with respect to said first carrier and for orthogonal frequency division modulating a second plurality of subcarriers with said second digital signal;

a combiner for combining said and second plurality of subcarriers to produce a composite signal; and

an antenna for transmitting said composite signal.

64. An in-band on-channel broadcasting transmitter as recited in claim 63, wherein said first digital signal and said second digital signal represent the same audio information.

65. An in-band on-channel broadcasting transmitter as recited in claim 63, wherein:

said upper sideband ranges from about 130 kHz to about 199 kHz from said first carrier; and

said lower sideband ranges from about -130 kHz to about -199kHz from said first carrier.

66. A receiver for an in-band on-channel broadcast signal including a first plurality of subcarriers positioned in upper and lower sidebands of a broadcast channel and orthogonal frequency division modulated by a first digital signal, and a second plurality of subcarriers orthogonal frequency division modulated by a second digital signal, wherein said second digital signal is delayed with respect to said first digital signal, said receiver comprising:

a demodulator for demodulating said first plurality of subcarrier to produce a first demodulated signal and for demodulating said second plurality of subcarriers to produce a second demodulated signal;

a time delay for delaying said first demodulated signal with respect to said second demodulated signal;

a blend control for selecting one said first and second demodulated signals to be used to produce an output signal; and

an output for producing an output signal in response to the selected one of said first and second demodulated signals.

67. A receiver for an in-band on-channel broadcast signal as recited in claim 66, wherein said first digital signal and said second digital signal represent the same audio information.

68. A receiver for an in-band on-channel broadcast signal as recited in claim 66, wherein:

said upper sideband ranges from about 130 kHz to about 199 kHz from said first carrier; and

said lower sideband ranges from about -130 kHz to about -199kHz from said first carrier.

69. A receiver for an in-band on-channel broadcast signal as recited in claim 66, wherein said blend control comprises:

a detector for detecting degradation of one said first and second demodulated signals by determining one or more parameters selected from the group consisting of signal-to-noise ratio, bit error rate, signal power level and cyclic redundancy check. --

In the Abstract:

Page 49, delete lines 1 and 2 in their entirety.

Page 49, line 4, delete "for mitigating intermittent".

Page 49, line 5, delete "interruptions in an audio radio broadcast system".

Page 49, line 14, after "to", insert -- a --.

Page 49, line 20, after "least", insert -- one --.

REMARKS

Several changes of an editorial nature have been made to the specification. Original claims 1-20 have been canceled and new claims 21-69 have been added.

Respectfully submitted,

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